In the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Original) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally, comprising:

a first tube section;

a second tube section aligned with the first tube section; and

an intermediate tube section with first and second end portions integrally connecting the first and second tube sections, respectively; the first and second tube sections being dimensionally different in size and the intermediate tube section having a shape transitioning from the first tube section to the second tube section;

the first tube section being larger in size than the second tube section and including an outer surface defining a tubular boundary, the first end portion including a continuous band of deformed material flared outward radially beyond the outer surface and which acts to support and maintain a columnar strength of the first tube section upon longitudinal impact, the second end portion contrastingly being configured to initiate a telescoping rolling of the second tube section during impact as the first tube section maintains its columnar strength.

2. (Original) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are formed from a single sheet of material, and wherein at least one of the first, second, and intermediate tube sections are heat-treated to include different material properties.

3. (Original) The energy management tube defined in claim 2, wherein the intermediate tube section and also one of the first and second tube sections are heat-treated.

4. (Original) The energy management tube defined in claim 3, wherein the intermediate tube section and the one tube section are annealed.

5. (Original) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are made from steel.

6. (Original) The energy management tube defined in claim 5, wherein the first, second, and intermediate tube sections are made from a material having a yield strength of structural steel, as set forth by the American Society of Testing and Materials (ASTM).

7. (Original) The energy management tube defined in claim 5, wherein the first, second, and intermediate tube sections are made from a material having a yield strength of at least about 35 KSI.

8. (Original) The energy management tube defined in claim 7, wherein the material has a yield strength of at least 80 KSI.

9. (Original) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are made from a heat treatable grade of material.

10. (Original) The energy management tube defined in claim 9, wherein the material in at least one of the first, second, and intermediate tube sections is heat-treated.

11. (Currently Amended) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are made from [material is] an annealable grade of material.

12. (Original) The energy management tube defined in claim 11, wherein the material in at least one of the first, second, and intermediate tube sections is annealed.

13. (Original) The energy management tube defined in claim 12, wherein the material in at least two of the first, second, and intermediate tube sections are annealed to have different material properties, including annealing the intermediate tube section.

14. (Original) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are made from a material having properties at least equal to the yield, tensile and elongation properties of a structural steel.

15. (Original) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are made from a high strength low alloy (HSLA) steel.

16. (Original) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are made from an ultra-high-strength steel.

17. (Original) The energy management tube defined in claim 1, wherein the first, second, and intermediate tube sections are roll formed longitudinally in a continuous roll forming process.

18. (Original) The energy management tube defined in claim 1, wherein at least one of the first, second, and intermediate tube sections are formed in part by being compressed to reduce their size.

19. (Original) The energy management tube defined in claim 1, wherein the first and second tube sections are longitudinally compressed to force the intermediate tube section to take on a pre-set shape, with the first and second end portions at least partially overlapping.

20. (Original) The energy management tube defined in claim 1, wherein the first tube section has a yield strength of at least about 10% greater than the second tube section.

21. (Original) The energy management tube defined in claim 1, wherein the first end portion has a radius of not less than about 0.5 times a wall thickness of the first tube section.

22. (Original) The energy management tube defined in claim 21, wherein the second end portion has a second radius of more than about 1.0 times a wall thickness of the second tube section.

23. (Original) The energy management tube defined in claim 1, including an insert positioned inside the first tube section.

24. (Original) The energy management tube defined in claim 1, including a bumper beam attached to a free end of one of the first and second tube sections.

25. (Original) The energy management tube defined in claim 1, including a vehicle frame attached to at least one of the first and second tube sections.

26. (Original) The energy management tube defined in claim 1, including a cross car frame member attached to at least one of the first and second tube sections.

27. (Original) The energy management tube defined in claim 1, wherein the first and second tube sections have similar geometric cross sectional shapes, but are different cross-sectional sizes.

28. (Original) The energy management tube defined in claim 27, wherein at least one of the first and second tube sections includes a rectangular cross section.

29. (Original) The energy management tube defined in claim 28, wherein at least one of the first and second tube sections includes a round cross section.

30. (Original) The energy management tube defined in claim 1, wherein one of the first and second tube sections includes a circular cross section at one location and a rectangular cross section at another location spaced longitudinally from the one location.

31. (Original) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally, comprising:

a first tube section;

a second tube section aligned with the first tube section; and

an intermediate tube section with first and second end portions integrally connecting the first and second tube sections, respectively; the first and second tube sections being dimensionally different in size and the intermediate tube section having a shape transitioning from the first tube section to the second tube section;

the second tube section being smaller in size than the first tube section, and including an inner surface defining a tubular boundary, the second end portion including a continuous band of deformed material flared inward radially inside of the boundary and which acts to support and maintain a columnar strength of the second tube section upon longitudinal impact, the first end section being configured to initiate a telescoping rolling of the first tube section during impact as the second tube section maintains its columnar strength.

32. (Original) The energy management tube defined in claim 31, wherein the first, second, and intermediate tube sections are formed from a single sheet of material, and wherein at least one of the first, second, and intermediate tube sections are heat-treated to include different material properties.

33. (Original) The energy management tube defined in claim 32, wherein the intermediate tube section and also one of the first and second tube sections are heat-treated.

34. (Original) The energy management tube defined in claim 33, wherein the intermediate tube section and the one tube section are annealed.

35. (Original) The energy management tube defined in claim 31, wherein the first, second, and intermediate tube sections are made from steel.

36. (Original) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally, comprising:

a first tube section;

a second tube section aligned with the first tube section; and

an intermediate tube section with first and second end portions integrally connecting the first and second tube sections, respectively; the first tube section being dimensionally larger in size than the second tube section and the intermediate tube section having a shape transitioning from the first tube section to the second tube section;

the intermediate section forming a continuous ring and, when cross sectioned longitudinally, being a non-linear wall segment where the first end portion defines a first radius on the wall segment and the second end portion defines a second radius on the wall segment, one of the first and second radii being smaller than the other radii;

the end portion with the one smaller radius providing a relatively greater support for columnar strength than the end portion with the other larger radius;

the end portion with the other larger radius being configured to initiate a telescoping rolling of the tube section with the larger radius;

whereby, upon undergoing a longitudinal impact, the intermediate tube section and the second tube section roll predictably and sooner than the first end portion and sooner than the first tube section upon the intermediate section receiving forces from the longitudinal impact.

37. (Original) The energy management tube defined in claim 36, wherein the first, second, and intermediate tube sections are formed from a single sheet of material, and wherein at least one of the first, second, and intermediate tube sections are heat-treated to include different material properties.

38. (Original) The energy management tube defined in claim 37, wherein the intermediate tube section and also one of the first and second tube sections are heat-treated.

39. (Original) The energy management tube defined in claim 38, wherein the intermediate tube section and the one tube section are annealed.

40. (Original) The energy management tube defined in claim 36, wherein the first, second, and intermediate tube sections are made from steel.

41. (Currently Amended) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally, comprising:

a first tube section;

a second tube section aligned with the first tube section; [and]

an intermediate tube section with first and second end portions integrally connecting the first and second tube sections, respectively; the first tube section being dimensionally larger in size than the second tube section, and the intermediate tube section having a shape transitioning from the first tube section to the second tube section; [and]

a support member positioned inside the first end portion and supporting the second end portion, the support member providing additional resistance to rolling; <u>and</u>

a crushable support member positioned inside the first tube section and configured to crush and to simultaneously assist in controlling rolling of materials upon receiving a longitudinal impact.

42. (Original) The energy management tube defined in claim 41, wherein the support member engages the intermediate tube section.

43. (Original) The energy management tube defined in claim 42, wherein the support member has an elongated constant shape that matably fits within the first tube section.

44. (Original) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally, comprising:

a first tube section;

a second tube section aligned with the first tube section; and

an intermediate tube section with first and second end portions integrally connecting the first and second tube sections, respectively; the first tube section being larger in size than the second tube section, and the intermediate tube section having a shape transitioning from the first tube section to the second tube section; and

the intermediate tube section and one of the first and second tube sections being annealed to have different material properties than the other of the first and second tube sections, the different material properties including a change in yield and elongation properties and being adapted to facilitate deformation and shaping of the intermediate tube section upon the intermediate tube section receiving stress sufficient to deform the intermediate tube section.

45. (Original) The energy management tube defined in claim 44, wherein the different material properties include increased elongation and lower yield properties adapted to support predictable and desired telescoping roll of the annealed one tube section during a longitudinal impact.

46. (Original) The energy management tube defined in claim 45, wherein the different material properties include increased elongation and lower yield properties adapted to support mechanically forming the one tube section, including changing a cross section of the one tube section to be different in size.

47. (Original) The energy management tube defined in claim 45, wherein the different material properties include increased elongation and lower yield properties adapted to support up-setting the intermediate tube section to a shape promoting rolling of material during a longitudinal impact.

48. (Previously Presented) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally, comprising:

a first tube section;

a second tube section aligned with the first tube section; and

an intermediate tube section with first and second end portions integrally connecting the first and second tube sections, respectively; the first tube section having a same shape as the second tube section and the intermediate tube section having a shape transitioning from the first tube section to the second tube section;

the intermediate section forming a continuous ring and, when cross sectioned longitudinally, being a non-linear wall segment where the first end portion defines a first radius on the wall segment and the second end portion defines a second radius on the wall segment, one of the first and second radii being smaller than the other radii;

the end portion with the one smaller radius providing a relatively greater support for columnar strength than the end portion with the other larger radius;

the end portion with the other larger radius being configured to initiate a telescoping rolling of the tube section with the larger radius;

whereby, upon undergoing a longitudinal impact, the intermediate tube section and the second tube section roll predictably and sooner than the first end portion and sooner than the first tube section upon the intermediate section receiving forces from the longitudinal impact.

49. (Previously Presented) The energy management tube defined in claim 48, wherein the first, second, and intermediate tube sections are formed from a single sheet of material, and wherein at least one of the first, second, and intermediate tube sections are heat-treated to include different material properties.

50. (Previously Presented) The energy management tube defined in claim 49, wherein the intermediate tube section and also one of the first and second tube sections are heat-treated.

51. (Previously Presented) The energy management tube defined in claim 50, wherein the intermediate tube section and the one tube section are annealed.

52. (Previously Presented) The energy management tube defined in claim 48, wherein the first, second, and intermediate tube sections are made from steel.

53. (Previously Presented) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally, comprising:

a first tube section;

a second tube section aligned with the first tube section; and

an intermediate tube section with first and second end portions integrally connecting the first and second tube sections, respectively; the first tube section having a same shape as the second tube section, and the intermediate tube section having a shape transitioning from the first tube section to the second tube section; and

the intermediate tube section and one of the first and second tube sections being annealed to have different material properties than the other of the first and second tube sections, the different material properties including a change in yield and elongation properties and being adapted to facilitate deformation and shaping of the intermediate tube section upon the intermediate tube section receiving stress sufficient to deform the intermediate tube section.

54. (Previously Presented) The energy management tube defined in claim 53, wherein the different material properties include increased elongation and lower yield properties adapted to support predictable and desired telescoping roll of the annealed one tube section during a longitudinal impact.

55. (Previously Presented) The energy management tube defined in claim 54, wherein the different material properties include increased elongation and lower yield properties adapted to support mechanically forming the one tube section, including changing a cross section of the one tube section to be different in size.

56. (Previously Presented) The energy management tube defined in claim 54, wherein the different material properties include increased elongation and lower yield properties adapted to support up-setting the intermediate tube section to a shape promoting rolling of material during a longitudinal impact.

57. (Previously Presented) A shock absorber comprising:

the smaller-diameter tube portion and the larger-diameter tube portion which are integrally formed by partially reducing or partially enlarging the straight tube that can be plastically deformable, and

the step portion formed continuously between the edge of the smaller-diameter tube portion and the larger-diameter tube portion by being folded the edge back to the each tube portions, wherein

a frictional member is mounted in an interior of the larger-diameter tube portion in order to control an amount of absorption of impact energy applied.

58. (Previously Presented) A shock absorber according to claim 57, wherein the step portion comprises a sectional structure in which a cross-sectional circular arc-shaped annular folded-back portion of the smaller-diameter tube portion having a smaller radius of curvature in a cross section thereof, a cross-sectional circular arc-shaped annular folded-back portion of the larger-diameter tube portion having a larger radius of curvature in a cross section thereof, an annular side surface being to join edges of the annular folded-back portions through edges thereof, and thereby forming the step portion integrally in S-shaped cross section.

59. (Previously Presented) A shock absorber according to claim 57, wherein the frictional member is an annular elastic member having the outer diameter of which is smaller than the inner diameter of the larger-diameter tube portion and the inner diameter of which is larger than the outer diameter of the smaller-diameter tube portion, and the annular elastic member is inserted to the interior of the larger-diameter tube portion.

60. (Previously Presented) A shock absorber according to claim 57, wherein the frictional member is an annular elastic member having the outer diameter of which is substantially equal to the inner diameter of the larger-diameter tube portion and the inner diameter of which is larger than the outer diameter of the annular folded-back portion of the smaller-diameter tube portion, and the annular elastic member is press-inserted to the interior of the larger-diameter tube portion.

61. (Previously Presented) A shock absorber comprising a smaller-diameter tube portion and a larger-diameter tube portion integrally formed by partially reducing or partially enlarging a plastically deformable straight tube, and a step portion that joins the smaller-diameter tube portion and the larger-diameter tube portion, wherein:

both a folded-back portion of the smaller-diameter tube portion and a folded-back portion of the larger-diameter tube portion, as joining to each other through the step portion, have a circular arc-shaped section with an arcuate angle more than 90 degrees; and

the step portion is formed to have an S-shaped section by joining the folded-back portion of the smaller-diameter tube portion and the folded-back portion of the larger-diameter tube portion.

62. (Previously Presented) The shock absorber according to claim 61, wherein:

the step portion is formed to have an S-shaped section, in which the radius of the circular arc-shaped section of the folded-back portion of the smaller-diameter tube portion is made smaller than that of the circular arc-shaped section of the folded-back portion of the larger-diameter tube portion.

63. (Previously Presented) The shock absorber according to claim 61, wherein:

the step portion is formed to have an S-shaped section by joining the folded-back portion of the smaller-diameter tube portion and the folded-back portion of the larger-diameter tube portion through an annular side surface.

64. (Previously Presented) An energy management tube adapted to reliably and predictably absorb substantial impact energy when impacted longitudinally comprising:

a first tube section having a first resistance to deformation;

a second tube section having a second resistance to deformation, the second resistance to deformation being greater than the first resistance to deformation; and

an intermediate tube section connecting the first tube section to the second tube section;

whereby, upon undergoing a longitudinal impact, the intermediate tube section and the first tube section roll predictably and sooner than the second tube section upon the intermediate tube section receiving forces from the longitudinal impact.

65. (Previously Presented) The energy management tube defined in claim 64, wherein the intermediate tube section includes a frusto-conical area.

66. (Previously Presented) The energy management tube defined in claim 64, wherein the intermediate tube section includes first and second end portions integrally connecting the first and second tube sections, respectively, to the intermediate tube section.

67. (Previously Presented) The energy management tube defined in claim 66, wherein the intermediate tube section forms a continuous ring and, when cross sectioned longitudinally, has a non-linear wall segment where the first end portion defines a first radius on the wall segment and the second end portion defines a second radius on the wall segment, one of the first and second radii being smaller than the other radii; and the end portion with the one smaller radius being configured to initiate a telescoping rolling of the tube section with the larger radius.

68. (Previously Presented) The energy management tube defined in claim 64, wherein a first transition between the first end portion and the first tube section is at a first angle and a second transition between the second end portion and the second tube section is at a second angle, the first angle being different than the second angle.

69. (Previously Presented) The energy management tube defined in claim 68, wherein the first angle is smaller than the second angle.

70. (Previously Presented) The energy management tube defined in claim 64, further including a component within the second tube section.

71. (Previously Presented) The energy management tube defined in claim 70, wherein the component is a bushing.

72. (Previously Presented) The energy management tube defined in claim 64, wherein the first, second and third intermediate tube sections are formed from a single piece1 of material.

73. (Previously Presented) The energy management tube defined in claim 64, wherein the second tube section is heat-treated, thereby making the second resistance to deformation greater than the first resistance to deformation.

74. (Previously Presented) The energy management tube defined in claim 73, wherein the intermediate tube section is heat treated.

75. (Previously Presented) The energy management tube defined in claim 74, wherein the second tube section and the intermediate tube section are annealed.

76. (Previously Presented) The energy management tube defined in claim 64, wherein the first tube section, the second tube section and the intermediate tube section are made from steel.

77. (Previously Presented) The energy management tube defined in claim 64, wherein the second tube section is thicker than the first tube section, thereby making the second resistance to deformation greater than the first resistance to deformation.